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PATENT AND TECHNICAL TRANSLATION

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* GERMAN AND FRENCH TO ENGLISH

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DECLARATION

The undersigned, Olaf Bexhoeft, hereby states that he is well acquainted with both the English and German languages and that the attached is a true translation to the best of his knowledge and ability of the German text of PCT/EP03/00212, filed 01/11/2003 and published 09/18/2003 under No. WO 03/077657 A1, and of two pages of amended specification and three pages of amended claims.

The undersigned further declares that the above statement is true; and further, that this statement was made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or document or any patent resulting therefrom.



Olaf Bexhoeft

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COOLING ARRAY

The invention relates to a cooling array with a housing receiving built-in electrical components and with an air conditioning arrangement, which is connected with a heat source of the built-in electrical components via a coolant-conducting inflow line and a return output.

Built-in electrical components, for example CPUs of computers, are specifically cooled by means of such cooling arrays. For this purpose, a cooling body, through which a liquid is passed, is placed on the respective heat source. The cooling body is connected to an air conditioning arrangement by means of an inflow and an outflow line.

These known solutions are mostly individual solutions which are only suitable in a limited way for commercial applications.

It is the object of the invention to produce a cooling array of the type mentioned at the outset which makes possible the air conditioning of complex systems with a multitude of built-in electrical components in a simple manner.

This object is attained in that several component inlet lines branch off the inflow line and several component outflow lines branch off the outflow line, and that at least one component inlet line and at least one component outflow line is assigned to a built-in electrical component.

It is possible by means of this cooling array to specifically remove large amounts of heat from a multitude of built-in electrical components. The collection of the removed amounts of heat takes place here in the outflow line. In this case it is possible to

individually connect the built-in electrical components to a component inlet line and a component outflow line. If several heat sources within a built-in component must be cooled, several component inlet lines and component outflow lines can also be connected. A large degree of flexibility is achieved in this way.

The inflow line the outflow line are conducted to an air conditioning arrangement. The latter can be an arrangement operating on the basis of the evaporation principle. For reasons of space, the air conditioning arrangement is preferably arranged outside the housing. It exchanges the heat energy removed from the housing with the surroundings. In this connection an advantage of the system results in that it is possible to remove very large amounts of heat from the housing. This allows the placement of components in the housing interior in a very compact form.

In accordance with a preferred embodiment it is provided that the component inlet and the component outflow lines have connecting elements at their ends, which can be joined together with corresponding counter-connecting elements to form coupling connections. Transfer points are made available to a user by means of this arrangement. By means of these he can perform the connection of the cooling array with the respective built-in electrical component via the coupling connections.

A possible layout of the cooling arrangement can be such that an inlet and a return flow line branch off the air conditioning arrangement and are connected to the inflow line and the outflow line, and that the connections are constituted by coupling connections. In that case the housing can be installed in the form of a system and can be connected simply and quickly with the air conditioning arrangement.

In order to prevent amounts of water which would endanger the built-in electrical components from flowing out in the area of the coupling connection during installation operations it can be provided that the coupling connections are embodied as couplings which can be separated and joined without dripping. This type of a coupling connection also makes it possible to later make a change in an operating cooling array. Accordingly, the built-in electrical components can also be connected or disconnected without problems while the cooling array is operating.

A possible embodiment variation of the invention can be distinguished in that the housing is a switchgear cabinet, in whose rear area constitutes a receiving space for the vertically extending inflow line and outflow line.

For achieving problem-free ventilation with this arrangement, it can be provided that in the roof area of the housing the inflow line makes a transition into the outflow line via a connecting line, and that a ventilating device is integrated into the connecting line.

The available cooling output at a built-in electrical component can be varied in a simple manner if it is provided that the amount of coolant conducted to the built-in electrical components can be controlled by means of a governor integrated into the component inlet line or the component outflow line.

In accordance with a preferred variation of the invention it can be provided that the inflow line and/or the outflow line are embodied as rigid profiled legs, which form a guide channel for the coolant, for example water. The profiled leg can be an extruded profiled section.

In accordance with a preferred variation of the embodiment it can also be provided that the housing has a support frame with vertical profiled sections, and that the inflow line and/or the outflow line is integrated into at least one profiled section.

The invention will be explained in greater detail by means of exemplary embodiments represented in the drawings.

The drawing shows a cooling array in a schematic representation. Here, a vertically extending inflow line 22 and an outflow line 26 are arranged in a housing 10. Built-in electrical components 11 have also been placed inside the housing 10. They contain heat sources which are to be cooled. Respectively one component inlet line 23 branches off the inflow line 22, and respectively one component outflow line 27 off the outflow line 26. In this case the built-in electrical components 11, which are switched parallel with each other, are connected to the inflow line 22 or the outflow line 26. The connection of the built-in components 11 is provided by means of coupling connections 28, which can be joined and separated without dripping.

A governor 30 has been integrated into the component outflow line for regulating the cooling output. It regulates the amount of flow-through of coolant.

The inflow line 22 and the outflow line 26 are connected to an inlet line 20, or an outflow line 29 via coupling connections 21. They lead to an air conditioning arrangement not represented in the drawing. The heat from the coolant (preferably water) is exchanged in it.

For being able to provide ventilation of the system, a ventilating device 24 has been installed in the area of a connecting line 25. The connecting line 25 is arranged in the area of the housing roof.